

Step 4: Reference Conditions

Purpose

To explain how ecological conditions have changed over time as the result of human influences and natural disturbances.

To develop a reference for comparison with current conditions and with key management plan objectives.

Soil Resources

Data Sources

- Snake River Basin Erosion Report (SRBER, 1979)
- Ecological Unit Inventory, Targhee National Forest (USDA FS 1999)
- A View To A River (Leopold, 1994)
- Landslide Mapping (GIS data layer)
- Geologic Map of the Driggs Quadrangle, Idaho (IDL, 1979)
- Targhee National Forest Subsections and Landtype Associations (USDA FS 1998)
- Geology and Petrogenesis of the Island Park Caldera of Rhyolite and Basalt, Eastern Idaho (Hamilton 1965)
- Landslide Hazards Related to Land Use Planning in Teton National Forest, Northwest Wyoming (Bailey 1971)
- Geologic and Hydrology History of the Sinks Drainages (Link 2003)
- Mass-gravity movements in the Madison and Gallatin Ranges, southwestern Montana, in West Yellowstone – Earthquake area: Billings Geol. Soc. Guidebook 11th Ann. Field Conf. (Hall 1960)
- The Effects of Forest Management on Erosion and Soil Productivity. Symposium on Soil Quality and Erosion Interaction, July 7, 1996. Soil and Water Conservation Society of America. Keystone, Colorado. 19 p. (Elliot, W.J., D. Page-Dumroese and P.R. Robichaud. 1996)

Historic Conditions –Erosion

Weathering, stream erosion, mass wasting, glaciation, and paraglaciation during the Pleistocene all had a role in shaping the uplands of the Blue Creek Watershed. During the Bull Lake glaciation period (32,000 y B.P.), lower temperature and increased precipitation increased mass instability resulting in active landslides (Bailey 1971). The low-relief topography has been incised by V-shaped drainages. The steeper portion of the watershed is uplifted from a shield volcano that forms the outer ridges of the caldera. The caldera is the result of a migrating hot spot that has moved up the Snake River

drainage over geologic time (Link 2003). Some of the geology of the area has the potential for natural erosion and mass instability (USDA FS 1999).

Localized intense thunderstorms that often occur in the area sometimes result in severe erosion on unprotected soils. Areas recently disturbed by road construction and timber harvest are vulnerable to erosion in the watershed. This erosion (background erosion) combined with erosion from man-caused disturbances is the cumulative erosion regime for the Blue Creek watershed. Background erosion on these soils is less than 0.25 tons per acre per year (Elliot et al. 1999).

Land use has played an important role in past erosion processes. A study completed for the Upper Snake River Basin identified the amounts of erosion from lands based on the type of use occurring on them. In Fremont County most of the area in the watershed is forested or used for rangeland agriculture and timber production. These kinds of uses produce much less erosion than other more intensive agricultural uses in the county such as dryland and irrigated crop production (USDA 1979). Forested and rangeland areas produce the least amount of erosion on a large scale because of protective cover found on the soils. The report identified intensive thunderstorms as the primary cause of severe erosion on unprotected soils. Table 18 **Erosion rate by land use type in Fremont County, Idaho (USDA, 1979).** below shows the results of the erosion study for Fremont County.

Table 18 Erosion rate by land use type in Fremont County, Idaho (USDA, 1979).

Land Use	Total Acres (Thousands of acres)	Less than 0.1 t/ac/yr (M acres)	0.1 – 0.5 t/ac/yr (M acres)	0.5 – 1.0 t/ac/yr (M acres)	1.0 – 5.0 t/ac/yr (M acres)	5.0 – 10.0 t/ac/yr (M acres)	>10.0 t/ac/yr (M acres)
Irrigated Surface	55.3		41.4		13.9		
Irrigated Sprinkler	58.2				58.2		
Dry Cropland	106.0				102.6	3.4	
Rangeland	414.0	56.2	304.3		53.5		
Forest	518.0	518.0					
Urban	5.5	4.3	1.2				
Other	36.0	32.0	4.0				
Total	1,193.0	610.5	350.9	0.0	228.2	3.4	0.0

Before the settlement of European man in the late 1800's to early 1900's, few roads and trails existed in the watershed. Since that time, many trails and roads have been pioneered or constructed near riparian areas and on the uplands that may have had an effect on watershed condition. Because roads have the greatest potential to create erosion and sediment, often the watershed condition can be directly related to the density of roads and trails, and their location and maintenance in the watershed. Other disturbances (i.e.

logging, grazing, mining, land development and recreation) also have played an important role in watershed condition. Where these kinds of disturbances have removed natural vegetation they have caused accelerated erosion to occur. However, only a few areas of the Blue Creek Watershed have been found to have declining soil conditions.

Disturbances

Wildfires occurred in the past usually during regular return intervals with similar results that occur presently. Wildfires that remove protective cover from the soil surface have contributed to forest and rangeland erosion in the past. Both wildfires and prescribed fires have occurred within the watershed in the recent past. No evidence has been found of declining condition due to wildfires. Roads and trails have taken a minimum of 306 acres out of production. In the watershed there have been 202 miles of road constructed. Only 37.1 miles have been obliterated and restored back to productivity. There are about 10 miles of open motorized and non-motorized trails in the watershed or about 7 acres out of production. These roads and trails represent approximately 0.5 percent of the acres in the watershed (Figure 109 **Transportation map of the Blue Creek analysis area.**). Timber harvest has also caused disturbance.

Land development on private holdings has increased in recent years. Figure 111 shows land development on private lands in the watershed. Approximately 3,482 acres (6.7%) of the watershed have been developed or subdivided for cabins and structures. These uses, combined with road construction, have had a substantial impact on taking soils out of productivity in the watershed.

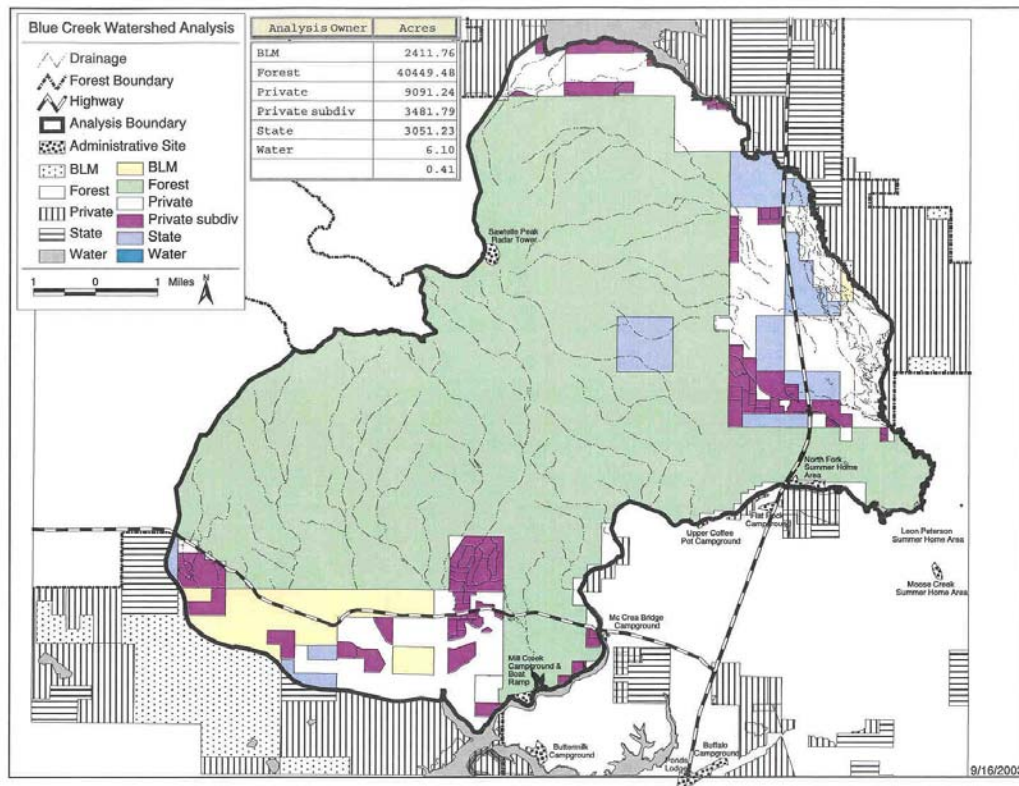


Figure 111 Areas colored in purple are land developments in the Blue Creek Watershed.

Historic Conditions – Ground Cover/Riparian Soils

Ground cover within the watershed is assumed to have been adequate to protect the soils from erosion before livestock were introduced into the area. This assumption is made based on the amount of biomass currently consumed by livestock that would be historically left as ground litter. Riparian areas and wetlands also had less impact from trampling and grazing before the introduction of livestock. Once livestock were introduced, historic intensive grazing occurred mostly by sheep in the southern portion of the watershed and by cattle grazing the northern portion of the watershed. Historically, no lands were farmed within the watershed boundary except for native hay pastures.

Historic Conditions – Mass Stability

Although a portion of the watershed has unstable geologic formations (USDA FS, 1999), few recent landslides are evident. None have been mapped in the Forest GIS landslide layer. Most of the past mass movements have occurred in the form of slumps and earthflows. Regional factors that have contributed to landslides in the watershed are:

- Relatively high relief and steep slopes with complex drainage patterns.
- Relatively weak or poorly consolidated rock material at high elevations.
- Significant valley glaciation that caused over-steepened valley slopes.
- Block faulting from earthquake activity.
- High moisture content near the surface.

Areas with these factors have potential for mass movement. A mass movement rating map is provided in the Current Conditions chapter.

Hydrology

Historic Conditions and Departures from Historic Conditions

Data Source/Gaps

- Idaho's Gateway to Yellowstone – The Island Park Story.
- Forest Stream channel and riparian assessments
- Forest GIS
- The time and location of past timber harvesting and associated road construction throughout the analysis area is a data gap.

Assumptions

- Land uses, both current and historical are the dominant influences on current watershed and stream channel condition.

Historic Conditions

History of the Henrys Fork River and watershed is available but little historic information is known for the analysis area itself. Ten to seventeen million years ago, a volcanic system, located in what is now southwestern Idaho, began migrating in a northeasterly direction. This process was responsible for a series of caldera-forming eruptions that formed the eastern Snake River Plain. The leading edge of the volcanic system, the Yellowstone resurgent caldera, or Yellowstone Plateau volcanic field, is located at the eastern edge of the Upper Henrys Fork sub-basin. These calderas produced enormous volumes of rhyolite lava at intervals of several hundreds of thousands of years. The Yellowstone resurgent caldera has erupted three times at intervals of about 600,000 years. The last eruption occurred about 600,000 years ago, and the existing thermal and seismic activity centered beneath the Yellowstone Plateau indicates that future eruptions are likely (Idaho DEQ 1998).

Approximately 7 miles north of Ashton, ID, is the rim of Big Bend Ridge. It is thought to be the margin of the first-cycle caldera (first of three) and now forms the southern and western rim of the Island Park basin. A series of valleys and ridges parallel to Big Bend Ridge represents slumped fault blocks created by partial collapse of Big Bend Ridge during the formation of the Henrys Fork caldera. Beginning five miles west of Henrys Lake at Red Rock Pass, the Henrys Lake Mountains form an arc that extends around and southeast of the lake to the Madison Plateau of Yellowstone national Park. Sawtell Peak (elevation 9866 ft.), the predominant landform within the analysis area, is part of this mountain range that forms the northern boundary of the Henrys Fork sub-basin (IDEQ 1998).

Henrys Fork flows from north to south through the Island Park basin. In some areas it has carved a gorge through the basalt that forms the floor of the basin. From Henrys

Lake outlet to river mile 72, directly west of Osborne Butte, the river drops less than seven feet of elevation per mile traveled. However, once reaching Big Basin Ridge, the river is down-cut as much as 600 feet through the basin floor, and loses more than 55 feet of elevation per mile.

The first human inhabitants saw pine woods, the clear sparkling Snake River (Henrys Fork) and other streams, the gorgeous Henrys Lake, lush meadows and miles of sagebrush, the same as today (Alison & Green 1974). The first known white man in the area was Gilman Sawtell, whom Sawtell Peak is named after. In 1872, W.H. Jackson, a survey photographer, described Henrys Lake as "...a shallow body of water about two by three miles in diameter, and full of small scattered islands, and the source of Henrys Fork. It is well stocked with most excellent trout." In 1924, Henrys Lake dam was completed allowing water storage for the lower Snake River valley farming interests. Other dams were constructed. The Buffalo River Dam was constructed in the 1930's to provide hydro power to the area. Power from this source was used to build the larger Island Park dam was also completed about the same time (Ibid).



Figure 112 Photo: US Forest Service

Logging in the Sawtell Peak area began around 1909, when the Stoddard family mill was moved to the lower Hotel creek area near the present Yale Creek – Kilgore road. In 1912, the mill was shifted to upper Hotel Creek. In 1926, the mill was moved to the Bootjack Pass area. There they logged the east face of Mt. Sawtell and the Henrys Lake area. During the Bootjack operation, the Stoddard's changed from horse logging to tractor logging and truck hauling (Ibid). There are also recordings of extensive tie logging, but no explicit accounts of logging within the analysis area.

An abundance of fish and excellent fishing has been the forte of the Henrys Fork. Henrys Lake was described as being “well stocked” with trout, and there are numerous old photographs showing stringers of fish. Though not as lucrative today, Henrys Lake and Henrys Fork River are still known for excellent fishing, attracting thousands of visitors annually.

In the 1990’s, the District closed numerous roads that have been constructed throughout the watershed. These closures have been reasonably effective and overall watershed stability has improved as a result of the closures.

Departures from Historic Conditions

The only historical description of area streams comes from the 1975 survey described above. For the most part, current stream conditions are similar, except Bootjack Creek. Bootjack Creek was described as having very good bank stability with a gravel substrate. Today, the stream is down-cut with highly unstable banks and a bottom substrate embedded with fine sediment. This is a substantial departure from conditions described earlier. Even though substantial timber harvesting apparently occurred in the late 1920’s and early 1930’s in the Bootjack drainage, it does not appear as if the logging itself had impacted the drainage. Degraded watershed and channel conditions appear to be from livestock grazing and motorized vehicle use.

Vegetation

Old Growth and Late Seral Forest

Old Growth forest is an important component of biological diversity. In 1993, the Intermountain Region completed a report on the characteristics of old growth forests in the Intermountain Region. More description about old growth characteristics can be obtained from this report. Currently, the area does not have a complete inventory of old growth forest. However, 412 permanent forest inventory plots are established across the Targhee portion of the forest. Of these, 3 plots are within the assessment area and have the characteristics of old growth. Majority of these plots are located in the Douglas-fir cover type. Based on these plots, and other NEPA analysis located in the Centennial Mountains, the highest probability of old growth and late seral stands would be found in the Douglas-fir and mixed conifer cover types.

Lodgepole

This cover type can be described as pure stands of lodgepole pine. In localized areas, small aspen patches can be found. Some Douglas-fir and subalpine fir seedling/saplings can be found in the understory when favorable soil and site conditions exist for these species.

Succession and Historic Condition

Lodgepole pine is the predominant species in the assessment area and mainly found in the lower elevations. This is due to the ability of lodgepole pine to withstand cold, poorly drained and/or low soil nutrient levels found in the Island Park caldera. Within the assessment area, generally lodgepole pine plays dominant and persistent successional roles. In the dominant seral role it can occupy a site for 100 to 200 years. These stands have Douglas-fir and subalpine fir as a very minor component. With the absence of fire, these species could eventually replace the lodgepole pine. In the persistent seral role lodgepole pine is present due to recurring disturbances such as surface fires. Due to lodgepole pine readily regenerating at high densities after fire, this condition usually excludes other conifers.

Prior to disturbance, stands were typically mature and single-storied with an open, park like appearance. The historical fire regime is usually lethal, stand-replacing with about 150 to 300 years between fires. Lodgepole pine has a history of extensive mountain pine beetle (*Dendroctonus ponderosae*) epidemics. Widespread mountain pine beetle mortality creates conditions favorable for stand replacing fires or later successional tree species. This typically created large patch sizes of even aged stands. Vegetation mapping that was done in the 1920's showed average patch sizes of mature stands up to 2,000 acres next to or within the assessment area.

Large mountain pine beetle outbreaks, in the 1960's and 1970's, led to large scale harvesting of stands. These harvesting techniques usually used the clearcut and salvage method and tended to fragment the lodgepole pine cover type into smaller patch sizes. Most of these areas have successfully regenerated to lodgepole pine.

Mixed Douglas-fir/Lodgepole

This cover type can be described as a mixture of Douglas-fir and lodgepole pine. Douglas-fir and lodgepole pine could be described as clumpy distribution across the cover type area. Aspen occurs in small patches throughout the area.

Succession and Historic Condition

The mixed Douglas-fir/Lodgepole pine cover type is a transitional type between the lodgepole pine and Douglas fir cover types. This type was more likely prone to fire at more frequent intervals than the lodgepole pine type. Fire return intervals probably ranged between 35 to 50 years. Fires were likely to be less severe. Fire behavior may have been stand replacing, but was likely mixed severity, with pockets of dense lodgepole pine experiencing crown fires and areas of Douglas-fir experiencing low severity. Large, fire resistant Douglas-fir usually survived these fires. Lodgepole pine regeneration dominated the regeneration after the fires. Since Douglas-fir is sensitive to frost it would be confined on topographic features that do not favor cold air drainage or frost pockets. Small scale frequent disturbances of insects and disease were typical.

Historical forest conditions would have been structurally diverse, with some small scale age class diversity, but high spatial heterogeneity because of the species composition.

Douglas-fir and Other Mixed Conifer

This cover type can be described as pure Douglas-fir stands in the lower elevations and southerly aspects of the cover type grading into a higher percentage of subalpine fir, Engelmann spruce, and lodgepole pine in the higher elevations and northerly aspects. Patches of aspen are found scattered throughout the cover type.

Succession and Historical Condition

In the lower elevations, open park-like stands were common with only clumpy patches of Douglas-fir seedlings and saplings in the understory. This was maintained by frequent, low intensity fires. Fire return intervals in these areas ranged from 10 to 25 years. Douglas-fir up to pole size is very sensitive to fire, hence an understory was usually excluded. In the higher elevations and northerly aspects fire return intervals were slightly longer with fire return intervals between 30 to 50 years. With the longer fire return intervals, subalpine fir and Engelmann spruce regeneration would establish and multi-storied structures would develop. In these areas, small crown fires could occur, thus creating a mixed severity fires. Aspen was scattered throughout the area. Fire readily maintained aspen which limited conifer encroachment.

Biological agents such as Douglas-fir beetle usually caused groups of dead trees forming regeneration gaps. Because of the relatively low stand densities, Douglas-fir beetle occurred at endemic levels. Defoliating insects, such as western spruce budworm occurred in the area with small outbreaks. Larger patches of aspen and lower densities of stands minimized the damage from western spruce budworm outbreaks.

Some timber harvest occurred in the late 1800's and early 1900's. This harvest consisted mainly of "high grading" of the larger diameter trees.

Aspen

This cover type can be described as being dominated by aspen. Large patches would be found in the lower elevations next to non-forest cover types with smaller patches intermixed with conifers in the higher elevations. Structure could be described as clumpy even-aged distribution with a closed canopy.

Succession and Historic Condition

Within the assessment area, majority of the aspen forest are considered seral to conifer forest. However, there could be very rare instances in the assessment area where aspen could be considered an edaphic climax species (edaphic climax is a persistent ecological climax resulting from soil factors and other site conditions). Historically, large patches of aspen occurred at lower elevations in the assessment area with smaller patches in the higher elevations mixed with conifers. The large patch sizes in the lower elevations were mainly due to fairly frequent fire cycles (20-50 years) in association with the nonforest types in the assessment area. Fires in these areas tended to be low severity surface fires. Due to aspen's aggressive suckering after a disturbance, this tended to maintain these stands. Surface fires also limited the encroachment of conifers on these sites. In the higher elevations, moderate severity fires in the conifer types maintained the smaller patches of aspen. With fire being the major disturbance, ages of stands tended to be

clumpy in age structures. Overall, fire played an important role in influencing changes in structure, composition, and distribution of this cover type.

Subalpine/Whitebark Pine

This cover type can be described as a clumpy distribution and composition of whitebark pine, limber pine, subalpine fir and Engelmann spruce. There is a higher component of subalpine fir and Engelmann spruce on the more mesic and northerly aspects. This cover type is located at the highest elevations near timberline along the continental divide within the assessment area.

Succession and Historic Condition

Within this cover type whitebark pine is generally a seral species. Subalpine fir and Engelmann spruce are the climax species. Whitebark pine usually occurred in scattered pockets or “stringer stands” and on the more mesic, northerly aspects, small individuals or pockets of regeneration of subalpine fir and Engelmann spruce would be in the understory of whitebark pine trees. Fires were very important disturbance agent to maintain the retention of whitebark pine in this cover type. Fire return intervals ranged from 50-100 years with a mix of low to moderate severity. These type of fires would reduce the competition from subalpine fir and Engelmann spruce and create openings for the regeneration of whitebark pine. The Clark’s nutcracker is the primary disperser of whitebark seeds and burned areas are the preferred area to cache seeds. This would create clumpy compositions and structures. Whitebark can grow on extremely harsh sites where subalpine fir, Engelmann spruce, and lodgepole pine cannot establish. In some cases, whitebark pine can modify the growing environment and allow the establishment of these species on harsher growing environments. Biological agents such as mountain pine beetle usually were at endemic levels and small older individual mortality would occur.

Disturbance

Disturbances are processes or events that alter landscapes at multiple scales. Fire, insects, disease, and human disturbances have all affected the Blue Creek Watershed Assessment area and continue to do so. In the recent past, the majority of disturbances have been related to timber harvest and insect outbreaks. These disturbances primarily occurred within the lodgepole, and mixed Douglas-fir/lodgepole pine cover types. Approximately 6,162 acres or 16% of the forested vegetation has been disturbed through timber harvest through the 1960’s to 1980’s. Recently, insect outbreaks of Douglas-fir beetle have affected approximately 2,500 acres. This is approximately 18% of the mixed Douglas-fir/Lodgepole and Douglas-fir cover types. However, these disturbances are still a relatively small percentage of the forested vegetation. This has resulted in a landscape dominated by mature, dense, vegetation which is susceptible to large scale disturbances.

Insects and Disease

Several insects and diseases have stood out in altering the Blue Creek Watershed Assessment area. Mountain pine beetle is the most important disturbance agent in lodgepole pine. Douglas-fir beetle and western spruce budworm are the most important agent in Douglas-fir. The most significant and destructive disease in the assessment area

is white pine blister rust. This disease is having a profound affect on the whitebark pine in the assessment area causing significant mortality. In aspen, various insects and diseases are normal components, including canker diseases, stem, root, and butt decays. Dwarf-mistletoe is in the area mainly effecting lodgepole pine. However, it is not a major disturbance agent within the assessment area. Mountain pine beetle, western spruce budworm, and white pine blister rust will be discussed below.

Mountain Pine Beetle

The mountain pine beetle is the most significant natural mortality agent of mature lodgepole pine. However, it is causing significant mortality in whitebark pine. Generally, mountain pine beetle prefers larger diameter (>8" DBH) lodgepole pine or whitebark pine with thick phloem. Endemic populations are always present, breeding in scattered mature trees. Outbreaks generally occur when large areas of suitable large diameter lodgepole pine are present. After the larger trees are killed smaller and smaller trees are infected. These type of trees have smaller amounts of phloem and populations decline to endemic levels. Widespread mountain pine beetle mortality results in conditions favorable for stand replacing wildfires or succession to late seral vegetation.

In the 1960's and 1970's the Island Park area experienced large areas of mortality in the lodgepole pine. This led to extensive salvage and clearcut harvesting in the late 1970's through the 1980's. Due to this harvesting, a significant amount of the lodgepole pine forest in the area has been converted to seedling/sapling size classes. Despite more than 50% of the lodgepole pine forest are in the mature age classes, the patch sizes are small enough not to promote a large outbreak. Currently, there is a low risk of a mountain pine beetle outbreak in the lodgepole pine cover type for quite a long time. In the whitebark pine cover type, competition from subalpine fir and Engelmann spruce, and the infection of white pine blister rust will continue to stress whitebark pine making them susceptible to mountain pine beetle attack.

Douglas-fir Beetle

The Douglas-fir beetle is the most destructive insect affecting Douglas-fir throughout its range. Normally, Douglas-fir beetle attacks small groups of trees however, during outbreaks, mortality of hundreds to thousand of trees are not uncommon. Significant losses can occur during periodic outbreaks. Outbreaks usually last 2 to 4 years, however, prolonged drought can extend the duration causing thousands of acres of mortality. At low endemic levels, beetles infest trees injured with fire scorch, excessive defoliation, root disease, and drought stress. Where these type of trees are abundant, populations build up and spread to existing standing green trees. Stands that are susceptible to Douglas-fir beetle have several types of conditions. These are:

- A high percentage of Douglas-fir. Usually in excess of 50-60%.
- Douglas-fir tree ages greater than 100 years.
- Tree size of Douglas-fir. Trees greater than 14" DBH are highly susceptible.
- Overall stand density. Stand densities over 120 basal area become moderately susceptible. Susceptibility increases as basal area increases.

Historically, Douglas-fir beetle was at endemic levels in the assessment areas. Douglas-fir stands were maintained at low densities due to frequent fires. However, fire suppression in this century has changed the structure of the Douglas-fir forest. Higher percentages of Douglas-fir, and stand densities have increased. Currently, the majority of the Douglas-fir cover type stands in the assessment area is at moderate to high susceptibility. Drought in the past several years has stressed these stands and triggered a Douglas-fir beetle outbreak in the assessment area. A western spruce budworm outbreak has also caused these stands to be stressed further. Based on recent surveys in 2002 and 2003, approximately 2,500 acres have had significant mortality (>70%). Within the vicinity of the area Douglas-fir beetle populations are at epidemic levels. With the abundance of highly susceptible stands, large patches of mortality are expected to occur. However, a significant change in long-term weather patterns or extended periods of intensely cold weather could slow the current outbreak (Bennett, Gibson, 2003).

Western Spruce Budworm

Western spruce budworm is the most widely distributed and destructive defoliator of coniferous forest in western North America. The first recorded instances of outbreaks in the United States were in Oregon in 1914. Western spruce budworm is a native defoliator that has co-evolved with its host. It feeds on a variety of host but the most significant damage is found in Douglas-fir stands. There is no typical pattern or trend in western spruce budworm outbreaks. However, outbreaks tend to somewhat cyclic, but cycles may be long, with short intervals between them. In the Intermountain west some outbreaks have lasted from early 1970's to the early 1990's. Outbreaks can infest large areas of susceptible host. In 2002, 11,700 acres of infested stands were recorded in northern portions of Caribou-Targhee National Forest. Part of this is within the assessment area. Some outbreaks can be severe and can cause growth loss, kill the tops of the host, and in some cases with multiple years of defoliation can cause mortality. Damage is usually the heaviest in the understory of multi-storied stands. These insects also affect the regeneration success by feeding directly on young trees or destroying developing cones. There are several criteria that influence the size and intensity of western spruce budworm outbreaks. They are:

- Warm, dry Douglas-fir habitat types are more susceptible.
- Species composition- Douglas-fir and true firs are more likely to be infested.
- Stand density-densely stocked stands more often damaged.
- Uneven aged or multiple storied stands sustain more damage.
- Host vigor – less vigorous trees sustain more damage
- Stand age – older trees sustain more damage than younger ones
- Surrounding forest types- forest of host type sustain longer, more wide-spread outbreaks.

Historically, within the assessment area western spruce budworm outbreaks have occurred. Crooks in the bole of Douglas-fir trees in the area are evidence of historical outbreaks. However, damage or mortality from western spruce budworm was probably less severe due to higher composition of non-susceptible host and stand densities tended

to be lower. Currently, a western spruce budworm outbreak is occurring in the area. The outbreak began in 2001. Approximately 600 acres of light defoliation is occurring now, however since this is early in the outbreak more defoliation is likely to occur. Majority of the Douglas-fir stands are highly susceptible western spruce budworm. Moderate to high damage is likely to occur in most Douglas-fir stands. Due to several years of drought and stand densities that are high, trees are highly stressed which will lead to higher probability of mortality occurring from defoliation. The trend for the assessment area is outbreaks will continue to occur and may be more severe in the future (Bennett, Gibson, 2003).

White Pine Blister Rust

The white pine blister rust is one of the most significant agents of change on whitebark pine stands. White pine blister rust is a non-native disease that was introduced to the United States in the early 1900's. The host are 5-needle pines including, whitebark pine and limber pine (*Pinus flexilis*). The rust needs to host to complete its life cycle. It spends part of its life cycle on the 5-needle pines and the other on currants or gooseberries in the genus *Ribes*. The disease causes cankers on branches of the host trees. Eventually the cankers kill the branches and eventually the tree. The disease also weakens the tree and predisposes it to mountain pine beetle attack as well. Since blister rust is a introduced disease and did not evolve here, genetic resistance is very low. Due to this high mortality rates occur. Currently, whitebark pine in the assessment area has some of the highest infection levels of the disease in Idaho.

Several phenotypic resistant trees have been identified in the assessment area. The cones from these trees have been collected and are currently being tested for genetic resistance. However, to get reliable results and a sustainable genetic resistant program could take up to 15 years to develop.

The trend for this disease in the assessment area will be very destructive to whitebark pine stands and eventually, eliminated from the assessment area.

Human Activity

Active logging and grazing started occurring as early as late 1800's to early 1900's within the assessment area. In the lower elevations, many Douglas-firs were "high-graded" where there were accessible slopes. Range fires may have been set during as well to improve grasses for grazing. Between 1920 and 1925, the railroad was expanded into the Island Park area. This caused a significant increase in harvesting of lodgepole pine for railroad ties. During the depression and war years lumber demand was reduced in the area. However, after the war demand increased in the area. Between 1953 and 1964 annual harvest on the District was between 9 and 18 million board feet. In the mid 1960's, the addition of modern stud mills and a mountain pine beetle outbreak an extensive salvage program developed. From 1964 to about the mid 1990's approximately 100,000 acres were salvaged on the district. Due to the large salvage program, the majority of the seedling/sapling and pole size structures in the lodgepole pine are a result of this. Limited harvest in the mixed and Douglas-fir stands occurred within this time period. Approximately 300 acres of harvest occurred. Most of the harvests were commercial thinnings or seedcuts. The majority of seedcuts in the Douglas-fir failed to regenerate. Most of these areas were planted with lodgepole pine. The most recent sale to occur in the assessment area was Willow Creek. Treatments mainly included commercial thinning and restoration of aspen within Douglas-fir stands.

Currently, timber production in the area has been on a downward trend similar to the rest of western United States. Currently, only 3 large mills operate in the area. Willmore Lumber (formerly Stoddard Lumber) located in St. Anthony, Idaho; RY Timber in Belgrade, Montana; and Louisiana Pacific in Deerlodge, Montana. Special products such as post and pole, house logs, and personal use firewood are still in high demand in the area and miscellaneous small businesses are scattered in the area.



Figure 113 Photo: U S Forest Service, 1950

Under the Revised Targhee National Forest Plan, 70% of the forested vegetation is in timber management prescriptions 5.x. 41% of the forested vegetation is in the Mount Jefferson roadless area. Under current plans and management constraints, approximately 55% of the forested vegetation in the Blue Creek Watershed Assessment area could be considered or available for timber harvest to meet vegetation management objectives. This percentage of area is outside of roadless areas and in management prescriptions 5.x. The majority of these areas are in Grizzly Bear Management Units (Management Prescription 5.3.5) which limits the scope and amount of vegetation management activity that can occur.

Aquatic Species and Habitat

Data Sources

- Sediment Study (Habitech)
- Comprehensive State Water Plan Henry Fork Basin (Idaho Water Resource Board 1992)
- Aquatic Resources of the Henry Fork Watershed (Intermountain Journal of Sciences, Vol. 6, No. 3, 2000)
- Hydrologic Alteration in the Henry Fork Watershed Upstream of St. Anthony (Rob Van Kirk Idaho State University 2004)
- History of Island Park (Dean H Green 1990)
- Stocking Records (IDFG)

Data Gaps

- R1/R4 Stream Habitat Surveys
- Knowledge of conditions on private lands

Historically, Yellowstone cutthroat would have inhabited the trout bearing streams within the analysis area. The current conditions indicate that none of the streams contain cutthroat though a few incidental cutthroat have been reported in the outlet or upper Henry Fork. No known reproducing populations are known though they existed in the past. Henry Lake and its tributaries that are outside the analysis area provide the only refuge area for Yellowstone cutthroat. Stocking of introduced non-native fishes such as rainbow trout and brook trout in the late 1800's has had a tremendous impact as well as changed conditions in habitat and land use. W.N. Stephens the second State Game Warden in 1905 reported that brook trout "seem to thrive and grow in our mountain streams...better than our native fish."

Fisheries have played a prominent role in this area since man has inhabited it. Numerous campsites have been discovered near tributaries to Henry Lake and its outlet that were used seasonally primarily by the Eastern Shoshone Indian Tribe.

Henry Lake

A commercial winter cutthroat fishery existed at Henry Lake as early as 1877 and each winter between the 1880s and 1890s between 50,000 and 100,000 lbs were frozen and shipped to Butte and Salt Lake City (Figure 114). The first documented rainbow trout hatchery operated at Henry Lake in 1891 and a brook trout hatchery was in operation in 1893 in the Shotgun Valley. The possibility of rainbows hybridizing with Yellowstone cutthroat has existed now for over 100 years.



Figure 114 Ice fishing huts and tents on Henry Lake Circa 1895 (from Green 1990).

Henry Lake has been stocked annually with over 1 million cutthroat, 100-200,000 hybrids, and 100-200,000 brook trout for the past 30 years. The rainbow cutthroat hybrid program began in earnest in 1960, prior to 1960, hybrids were only documented as being stocked in 1952 when 8,000 were planted. IDFG records show fairly consistent stocking of cutthroat since about 1933 and probably since the mid-1920's when the State hatchery was first established.

Fish Stocking

The U. S. Commission of Fish and Fisheries (USCFF) was the first agency established specializing in fish. Their primary role in the late 1800's and early 1900's was the providing of eyed eggs and fry to any group interested. It was a common practice for streams and lakes to be stocked by private citizens or interest groups via fish packed in milk cans or stocking by train at bridges (Figure 115). Nearly all of the fish stocking prior to the 1940's is undocumented. No thought was given as to whether or not fish already occurred in the receiving waters.



Figure 115 Stocking from milk cans (From Green 1990).

Island Park Reservoir and Tributaries

Prior to construction of the Island Park Dam, fluvial (large river dwelling) cutthroat would have spawned in the smaller tributaries and big springs as well as in the main river. With the construction of the dam, these fluvial populations apparently adapted to an adfluvial life history pattern.

Prior to the chemical treatment of Island Park Reservoir in 1958 it contained a population of large adfluvial (lake dwelling) Yellowstone cutthroat. Every spring the cutthroat of spawning age would have run up local tributaries and as far up the Henry Fork as Big Springs to spawn, helping to maintain cutthroat in these areas. This spring spawning run of cutthroat provided a popular fishery for Yellowstone cutthroat near Mack's Inn and the Flat Rock Club. With the elimination of these adfluvial cutthroat and the introduction of rainbow trout and brook trout, reproducing populations of cutthroat were eliminated along with the popular spring fishery.

The near total disappearance of Yellowstone cutthroat in the Henry Fork Drainage except for Henrys Lake can be traced back to chemical treatments in 1958 and 1966 where Island Park Reservoir and the Henry Fork were chemically treated down to Mesa Falls and Ashton removing nearly all fish. After these treatments the reservoir and river were restocked with rainbow trout. The reservoir was also chemically treated in 1979 and 1992 to reduce Utah chub populations. During both of these treatments large quantities of sediment were mobilized, forming the impetus for the formation of the Henrys Fork Watershed Council in 1994. Future treatments of Island Park Reservoir are not likely to occur.

Island Park Reservoir has been stocked almost exclusively with rainbow trout, coho salmon, and kokanee salmon since 1966 with a scattering of small numbers of Henry Lake cutthroat stockings. The coho stocking was discontinued in the late 1980's.

Streams and Stocking Information

Table 19 Stocking information contains the documented information on fish stocking that has been recorded by IDFG. Much of the early stocking that occurred was undocumented, as almost all the fish bearing streams now have brook trout, but only two have documented stockings. Just as certain species today are illegally stocked by "sportsmen" with out regard for fish management objectives, certainly many fish were moved around by fisherman prior to the active stocking activities of IDFG.

Table 19 Stocking information.

Stream	Stocked	Rainbow Trout (year)	Brook Trout (year)	Cutthroat Trout (year)
Arrange Creek	No			
Hotel Creek	Yes		1942, 47-65	1939
Yale Creek	No			
Mill Creek	Yes	1968, 88,89,92,93		1920, 68, 72
Elk Spring Ck.	No			
Coffee Pot	Yes	1934-35		
Tyler Creek	Yes	1949, 62		
Sawtell Creek	No			
Bootjack Creek	No			
Hope Creek	No			
Rock Creek	No			
Crooked Creek	Yes	1916, 32	1916	1921, 84
Upper Henry Fk.	Yes	1968-03		1984, 85, 86, 89, 90, 92, 2002, 03

Irrigation

Almost every creek is diverted after it leaves National Forest System lands. A few are diverted before leaving the Forest. These diversions have severed connectivity between these smaller streams and the larger Henrys Fork or Henrys Lake and have isolated these populations so there is little to no exchange of fish. Historically, many of these streams would have provided spawning areas for fluvial and adfluvial cutthroat.

Drought years exacerbate the problem of connectivity, because when water is needed most it is likely to be 100 % diverted, except for a very short period in the spring. Most diversions can be traced back to the late 1800's or early 1900's. Sawtell Creek is diverted up high and runs in a channel parallel to the natural channel and then empties into an irrigation pond, which is in the same drainage as the original channel. Over the years the ditch has deeply eroded depositing tons of sediment into the pond. These ditches or artificial streams provide limited fish habitat. Rock Creek is also diverted and dewatered up high on the Forest eliminating connectivity. Tyler Creek is the only creek that reaches its receiving water without alteration from irrigation diversions.

Terrestrial Species and Habitat

Pre-settlement population, or even presence within the watershed, is unknown for many TES (Threatened and Endangered Species). A description of the required habitat for specific species is used as the desired habitat conditions.

The gray wolf occurred historically in the northern Rocky Mountains, including mountainous portions of Wyoming, Montana, and Idaho. The drastic reduction in the distribution and abundance of this species in North America was directly related to

human activities, particularly extensive predator control efforts by private, State, and Federal agencies. The natural history of wolves and their ecological role was poorly understood during the period of their eradication in the conterminous United States. As with other large predators, wolves were considered a nuisance and threat to humans (USDI 1994b).

Historical accounts do show that lynx have been harvested in both Montana and Idaho close to or within the watershed analysis area (Ruggiero et. al 1999) so it can be assumed that lynx would have been found here periodically and probably associated with cyclic population increases in their northern home ranges. Recent analysis of vegetation in the Southern Boreal Forests has concluded that this watershed may provide potential habitat for lynx although primary prey (snowshoe hares) exist at very low density. Hare densities may increase as forest succession moves portions of the watershed towards climax (spruce/fir) cover types.

Wolverine (*Gulo gulo*) - Alpine cirque and talus slopes are important for den sites and is available in limited quantity within the watershed. Travel corridors are usually located in spruce/subalpine fir forested areas near natural openings with limited human activity and an adequate forage base. The movements of dispersing or spatially unattached wolverine may include lowland vegetation communities generally considered nontypical in nature for wolverine. Pre-settlement presence is unknown but now theorized to have always been restricted to mountain areas (Ruggiero et.al. 1994, Groves et.al. 1997, Spahr et. al. 1991, Inman 2007 pers. communication).

Boreal owl (*Aegolius funereus*) - prefer to nest in tree cavities in mature subalpine fir or Engelmann spruce forests with a high density of large trees and forage on small mammals, birds and insects (Hayward 1994, Groves et.al. 1997, Spahr et. al. 1991). Pre-settlement presence is unknown but is likely to be less than present because fire suppression has allowed forest structure within the watershed to mature and density of trees to increase.

Great gray owl (*Strix nebulosa*) - use nests abandoned by hawks or on the tops of snags in mature lodgepole pine or subalpine fir forests bordering small openings or meadows (Hayward 1994). They prey on voles, mice etc. along edges of clearings. (Groves et. al.1997 & Spahr et.al 1991). Pre-settlement presence is unknown.

Northern goshawk (*Accipiter gentilis*) nest in a mature (aspen and conifer) forest stands with closed tree canopies, high density of large trees on slopes <30% & northerly exposures. They prey on birds & mammals within forest canopy. (Reynolds et al 1991, Groves et. al 1997, and Spahr et.al 1991). Pre-settlement population is unknown but is likely less than current conditions since fire suppression in the last century has allowed forest canopy and density to increase over historic levels..

Three-toed woodpecker (*Picoides tridactylus*) - nests in snags. They feed on bark beetle larvae usually in subalpine fir habitat types (spruce-fir and lodgepole pine in a variety of

successional stages). (Groves et.al 1997 & Spahr et.al 1991). Local population levels are reflective of conifer tree mortality. Pre-settlement presence is unknown.

Mule Deer - “Populations have declined since the 1950s and 1960s statewide. Because they are adapted to transitional, seral habitats, and because management activities (prescribed burning) are not occurring at historic levels, populations are not expected to rise to those levels. Generally, annual mortality is due to predation, winterkill, accidents, hunting, weather, and possible competition with elk and disease (Kuck and Compton, 1999). Additions to hunting regulations have included antlerless opportunities designed to stabilize or reduce populations. Recent population declines in part of southern Idaho are a result of severe winters when significant winter mortality occurred and loss of aspen habitat. Aspen habitat loss is the result of fire suppression and encroachment by human uses of the landscape. Generally, for mule deer, the buck/doe ratio minimum objective is fifteen bucks per one hundred does (15:100).”

Elk -Elk are distributed across Idaho and are classified as habitat generalists. Elk populations can be influenced by human harvest. Because harvest is highly influenced by access on public lands, the most critical habitat factor facing managers is the use of roads. Overall, elk populations statewide are near all time highs and objectives are generally being met statewide for total cows, bulls, and adult bulls; however, some zones are not meeting these objectives. Areas on the Forest are generally meeting or exceeding objectives.

Range and Livestock

Bootjack C&H

Prior to 1937 there were 4 bands of sheep on the (then called) Sawtell S&G Allotment. In 1937 the allotment was divided into four divisions. The Sawtell Division was renamed the Bootjack Allotment in 1942. From 1943 to 1945, the area was grazed in common with cattle permitted to the Twin Creek Association. In 1962 the allotment was converted from sheep to cattle (200 head from 7/11 to 9/10 for 300 AM's). The allotment contains four perennial streams: Rock Creek, Bootjack Creek, Sawtell Creek, and Kenney Creek. These creeks are used for agricultural irrigation and stock watering.

Meadow View C&H

Records indicate that the last time the allotment may have been used was in 1992. Since that time there are no records indicating use by domestic livestock. The permittee had their permit for horse use cancelled in 1989. The allotment has been vacant since that time.

Icehouse/Willow S&G

This allotment has been exclusive sheep range since its creation. The first permits were issued in 1909. There are no records prior to 1931. From 1931 to 1951 preference was for 1250 sheep for a two month period. In 1951 the preference was reduced to 900 sheep

for a two month period. The current allotment was created out of parts of the old Willow Creek and Icehouse Allotments in the early 1930's. Prior to 1930 the allotment was managed on a deferred rotational basis. Typically one side of the allotment was grazed later in the season than the other one. This was reversed the next year. The upper portion of the allotment is unsuitable for grazing and has been closed for years. Small numbers of wildlife spend approximately 6 months (spring-summer-fall) on the allotment. Wildlife typically winter in Montana or on Sand Creek (Ashton to St. Anthony).

Fire and Fuels

Historically, fire has been part of the ecosystem on the Caribou-Targhee National Forest. Reports as early as the 1800's indicate fire occurred throughout the area. W.P. Hunt reported on September 9, 1811 in his diary, "The valleys had recently been burned by grass fire" (Webster, R.L., Caribou History). This was the first record of fire on the Caribou when he mentioned that recent fire in the country between Fish Creek divide and present day Alexander Gap had destroyed all the horse feed. Pioneer settlers reported that forest fires during the 1870's, and as late as 1888, burned uncontrolled all summer long in the Caribou Forest. (Webster, R.L., Caribou History).

Native Americans set whole drainages on fire to improve grazing and wildlife habitats. (Lewis 1973), (Kay 1994; Russell 1983). History points to severe fires during the past 100 years that nearly destroyed most of the old fir stands. Studies done in the last 50 years show an increase in the Douglas fir encroachment into the Aspen/shrub ecosystem. Information from the Targhee Revised Forest Plan shows that the fire return interval for the Douglas fir at a 20-50 year interval, for Lodgepole pine at a 40 to 60 year interval with the maximum at 100 years, the Sagebrush/ grass lands at an interval of 10 to 25 years and the Whitebark/Limber pine at a 30 to 300 year interval.

Human Uses

Recreation use in the past was mostly non-motorized. Snowmobile use occurred primarily on groomed trails or in areas adjacent to those groomed trails. Dispersed camping has occurred in the area for more than fifty years, however at much lower levels than occurs today. Summer off-road motorized use was non-existent.